

Section I (Amendments to the Claims)

Please amend claims 1 and 22, as set out in the following listing of the claims of the application.

1. **(Currently Amended)** An electrode assembly for analyzing a sample metal electroplating solution, comprising a measuring electrode and at least one of (1) an *in situ* cleaning mechanism for cleaning the measuring electrode in a measuring chamber, (2) a nucleation and metal growth optimization mechanism, and (3) a voltage limiting mechanism,

said *in situ* cleaning mechanism comprising an auxiliary electrode and an auxiliary current source connected to said auxiliary electrode, wherein the measuring electrode is detachably connectable to a measuring circuit and said auxiliary current source, so that when both the measuring electrode and the auxiliary electrode are immersed in a sample metal electroplating solution or an electrolytic cleaning solution, the measuring electrode is detached from the measuring circuit and attached to the auxiliary current source and the auxiliary current source applies a cycling electric current to the measuring electrode and the auxiliary electrode through said sample metal electroplating solution or electrolytic cleaning solution for a sufficient number of cycles to effect an *in situ* galvanodynamic cleaning and depassivating of the measuring electrode, wherein the auxiliary current source is constructed and arranged to apply said cycling electric current to the measuring electrode and the auxiliary electrode until the electropotential measured by the measuring electrode reaches an asymptotic limit;

said nucleation and metal growth optimization mechanism comprising a rotation speed controller, which is connected to the measuring electrode for rotating the measuring electrode at various rotation speeds during a metal plating/analyzing cycle, wherein during an initial nucleation stage, said rotation speed controller effectuates rotation of the measuring electrode at a first predetermined speed, wherein after said initial nucleation stage, said rotation speed controller effectuates rotation of the measuring electrode at a second predetermined speed that is substantially higher than the first predetermined speed, and wherein said rotation speed controller sends an output signal for initiation of a

subsequent metal growth stage when the rotation of the measuring electrode at said second predetermined speed stabilizes; and

said voltage limiting mechanism comprising a voltage controller for monitoring electropotential at a surface of the measuring electrode and for applying an opposite electric current to the measuring electrode when the electropotential exceeds a predetermined value, so that said electropotential is maintained at not more than said predetermined value during various stages of a metal plating/analyzing cycle, ~~said current being applied until the electropotential measured by the measuring electrode reaches an asymptotic limit,~~

2. **(Original)** The electrode assembly of claim 1, comprising said *in situ* cleaning mechanism.
3. **(Original)** The electrode assembly of claim 2, wherein both the measuring electrode and the auxiliary electrode are immersed in an electrolytic cleaning solution comprising sulfuric acid and optionally potassium sulfate, and wherein the auxiliary current source applies a cycling electric current to the measuring electrode and the auxiliary electrode through said electrolytic cleaning solution, for *in situ* cleaning and depassivating the measuring electrode.
4. **(Original)** The electrode assembly of claim 3, wherein said electrolytic cleaning solution is substantially free of copper sulfate and organic additives.
5. **(Original)** The electrode assembly of claim 3, wherein said electrolytic cleaning solution comprises sulfuric acid at a concentration in a range of from about 0.1M to about 1M.
6. **(Original)** The electrode assembly of claim 5, wherein said electrolytic cleaning solution further comprises potassium sulfate at a concentration in a range of from about 0.1M to about 1M.
7. **(Original)** The electrode assembly of claim 3, wherein said electrolytic cleaning solution comprises sulfuric acid at a concentration in a range of from about 0.1M to about 0.3M.

8. (Original) The electrode assembly of claim 7, wherein said electrolytic cleaning solution further comprises potassium sulfate at a concentration in a range of from about 0.3M to about 0.5M.
9. (Original) The electrode assembly of claim 2, wherein the cycling electric current applied by said auxiliary current source is characterized by a current cycling range of from about $-10\text{mA}/\text{cm}^2$ to about $10\text{mA}/\text{cm}^2$, a cycling rate of from about 0.5mA/second to about 5mA/second, and a cycling duration of at least 10 cycles.
10. (Original) The electrode assembly of claim 2, wherein the measuring electrode, the auxiliary electrode, and the auxiliary current source are integrated into a unitary module.
11. (Original) The electrode assembly of claim 2, wherein said electric current cycles from about $-8\text{mA}/\text{cm}^2$ to about $8\text{mA}/\text{cm}^2$.
12. (Original) The electrode assembly of claim 2, wherein said electric current cycles from about $-6\text{mA}/\text{cm}^2$ to about $6\text{mA}/\text{cm}^2$.
13. (Original) The electrode assembly of claim 2, wherein said electric current has a cycling rate in the range of from about 1mA/second to about 3mA/second.
14. (Original) The electrode assembly of claim 2, wherein said electric current has a cycling rate of about 2mA/second.
15. (Original) The electrode assembly of claim 2, wherein said cycling electric current is provided for at least 15 cycles.
16. (Original) The electrode assembly of claim 2, wherein said cycling electric current is provided for at least 20 cycles.
17. (Original) The electrode assembly of claim 2, wherein said cycling electric current is provided for at least 30 cycles.

18.-21. (Cancelled)

22. (Currently Amended) A method for *in situ* galvanodynamic cleaning and depassivating a measuring electrode in a measuring chamber arranged for analyzing a sample metal plating solution, comprising the steps of:

- (a) providing an electrode assembly including said measuring electrode as in claim 1, ~~wherein said electrode assembly comprises the~~ and an *in situ* cleaning mechanism for cleaning the measuring electrode in the measuring chamber, said *in situ* cleaning mechanism comprising an auxiliary electrode and an auxiliary current source connected to the auxiliary electrode, wherein the measuring electrode is detachably connectable to a measuring circuit and said auxiliary current source;
- (b) reattachably disconnecting the measuring electrode from [[a]] the measuring circuit and detachably connecting the measuring electrode to the auxiliary current source;
- (c) immersing both the measuring electrode and the auxiliary electrode in a sample metal plating solution or an electrolytic cleaning solution;
- (d) using said auxiliary current source to apply a cycling electric current to the measuring electrode and the auxiliary electrode through said sample metal plating solution or electrolytic cleaning solution, for a sufficient period of time for *in situ* cleaning and depassivating the measuring electrode, with the cycling electric current being applied until electropotential measured by the measuring electrode reaches an asymptotic limit; and
- (e) optionally, repeating steps (b)-(d) before each analytical measurement cycle.

23. (Original) The method of claim 22, wherein both the measuring electrode and the auxiliary electrode are immersed in an electrolytic cleaning solution comprising sulfuric acid and optionally potassium sulfate, and wherein the auxiliary current source applies a

- cycling electric current to the measuring electrode and the auxiliary electrode through said electrolytic cleaning solution, for *in situ* cleaning and depassivating the measuring electrode.
24. **(Original)** The method of claim 23, wherein said electrolytic cleaning solution is substantially free of copper sulfate and organic additives.
25. **(Original)** The method of claim 23, wherein said electrolytic cleaning solution comprises sulfuric acid at a concentration in a range of from about 0.1M to about 1M.
26. **(Original)** The method of claim 25, wherein said electrolytic cleaning solution further comprises potassium sulfate at a concentration in a range of from about 0.1M to about 1M.
27. **(Original)** The method of claim 23, wherein said electrolytic cleaning solution comprises sulfuric acid at a concentration in a range of from about 0.1M to about 0.3M.
28. **(Original)** The method of claim 27, wherein said electrolytic cleaning solution further comprises potassium sulfate at a concentration in a range of from about 0.3M to about 0.5M.
29. **(Original)** The method of claim 22, wherein the cycling electric current applied by said auxiliary current source is characterized by a current cycling range of from about $-10\text{mA}/\text{cm}^2$ to about $10\text{mA}/\text{cm}^2$, a cycling rate of from about 0.5mA/second to about 5mA/second, and a cycling duration of at least 10 cycles.
30. **(Original)** The method of claim 29, wherein said electric current cycles from about $-8\text{mA}/\text{cm}^2$ to about $8\text{mA}/\text{cm}^2$.
31. **(Original)** The method of claim 29, wherein said electric current cycles from about $-6\text{mA}/\text{cm}^2$ to about $6\text{mA}/\text{cm}^2$.

32. **(Original)** The method of claim 29, wherein said electric current has a cycling rate in the range of from about 1mA/second to about 3mA/second.
33. **(Original)** The method of claim 29, wherein said electric current has a cycling rate of about 2mA/second.
34. **(Original)** The method of claim 29, wherein said cycling electric current is provided for at least 15 cycles.
35. **(Original)** The method of claim 29, wherein said cycling electric current is provided for at least 20 cycles.
36. **(Original)** The method of claim 29, wherein said cycling electric current is provided for at least 30 cycles.
- 37.-43. **(Cancelled)**